BLACKBODY RADIATION

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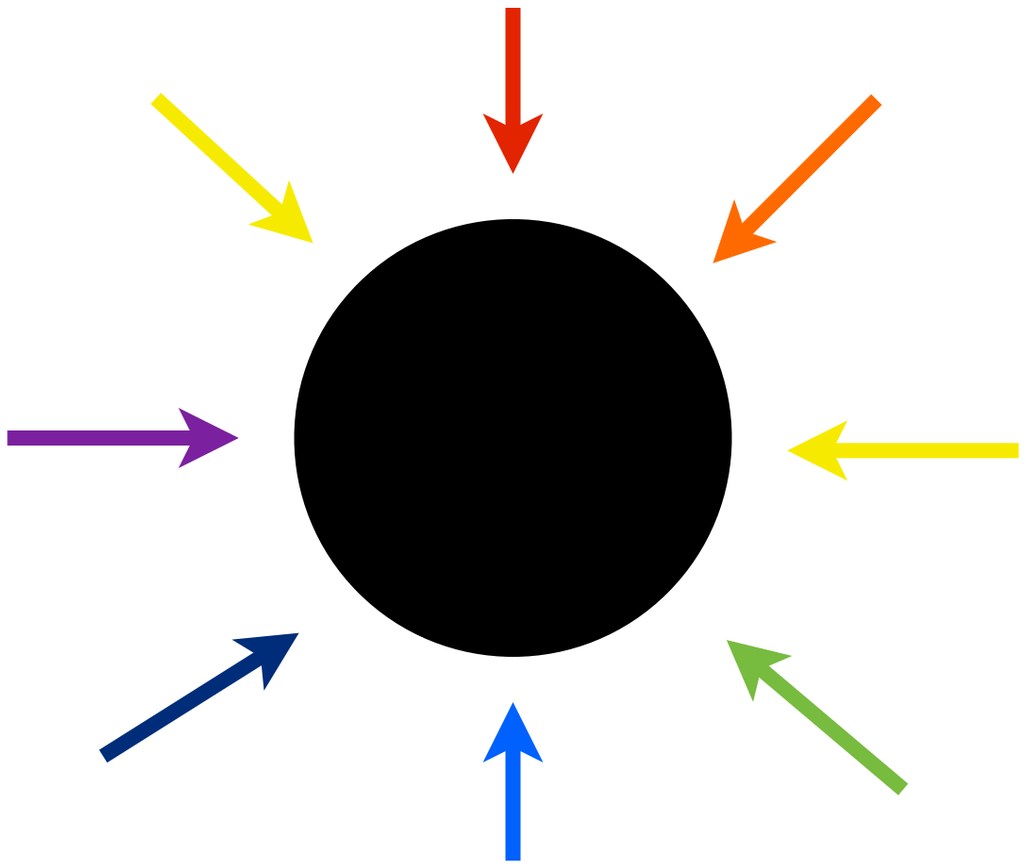
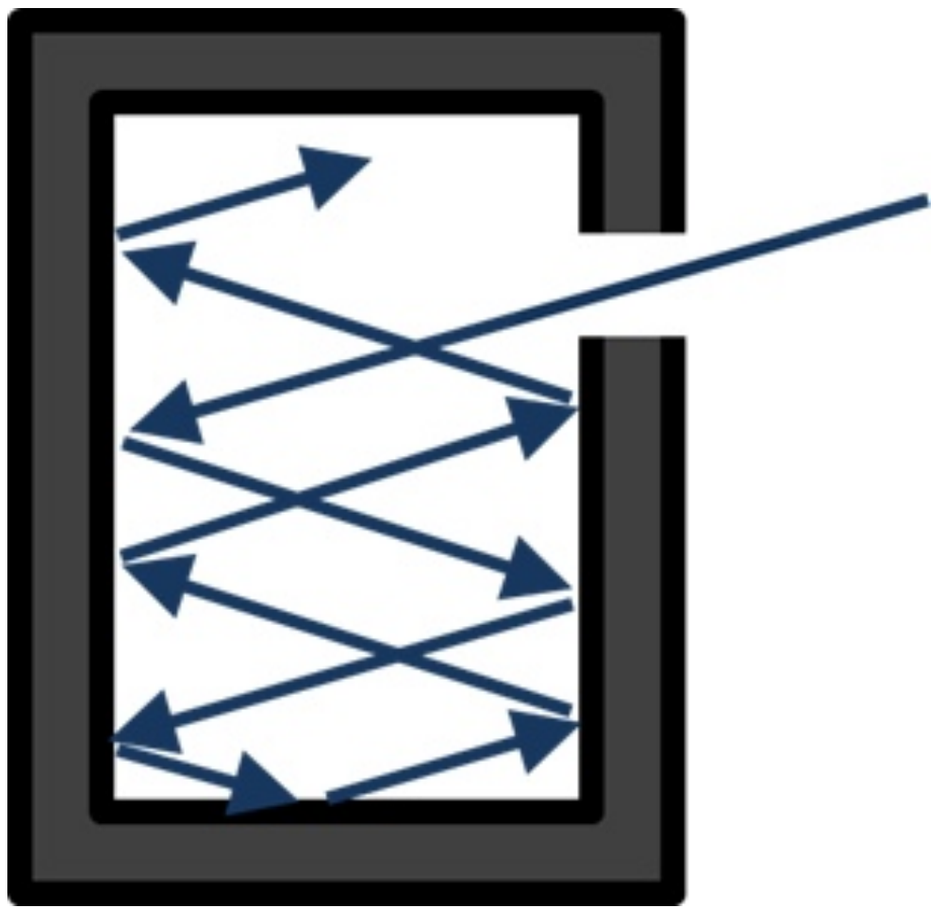
A **BLACK BODY** IS A THEORETICAL OBJECT THAT ABSORBS 100% OF THE RADIATION THAT HITS IT.



SO WHAT'S BLACKBODY RADIATION?

Black bodies are perfect emitters of radiation.

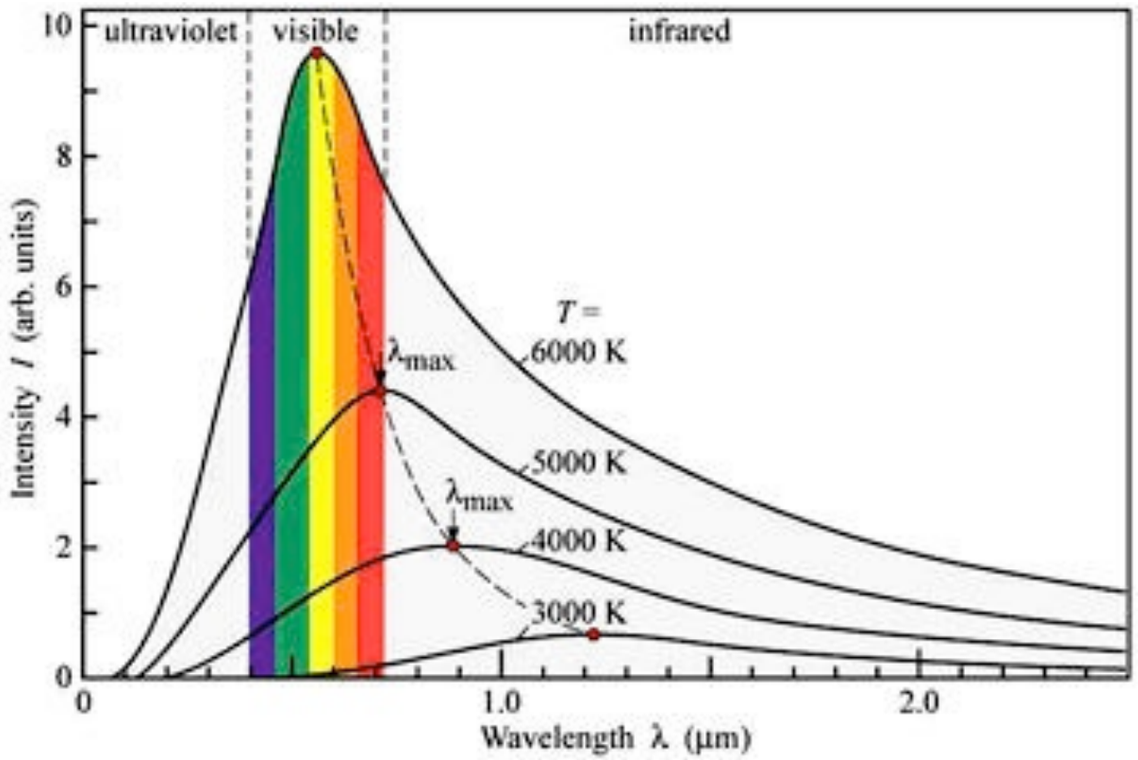


At a particular temperature, black bodies emit the maximum amount of energy possible for that temperature.

That value= blackbody radiation

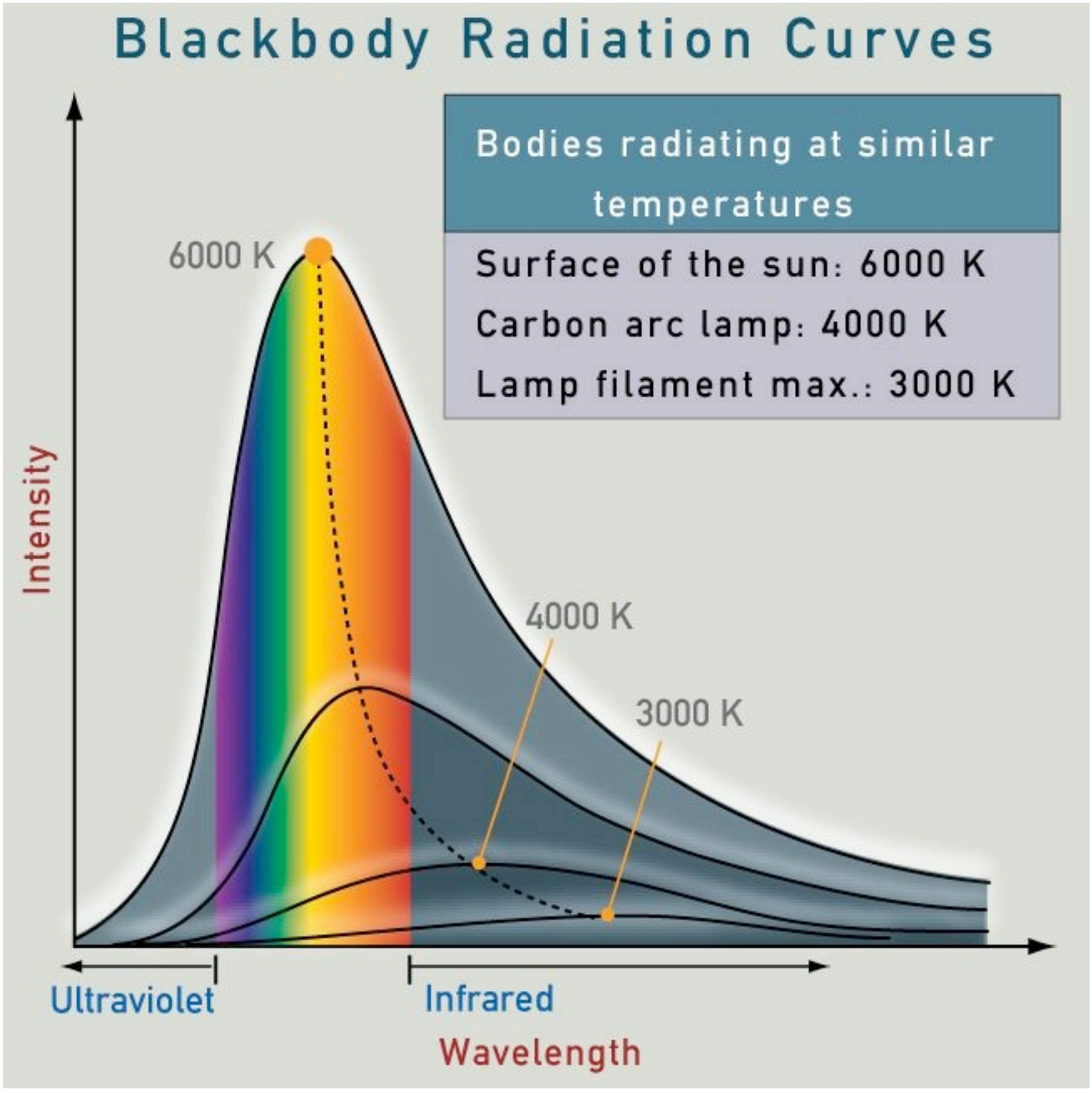
BLACKBODY RADIATION CURVES

Black bodies emit a definite amount of energy at each wavelength for a particular temperature, so standard curves can be drawn.



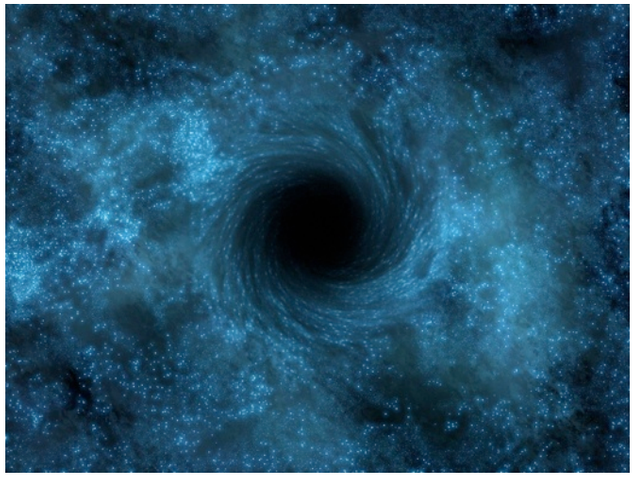
Planck's Law

$$P_\lambda = \frac{2\pi hc^2}{\lambda^5(e^{(hc/\lambda kt)}-1)}$$

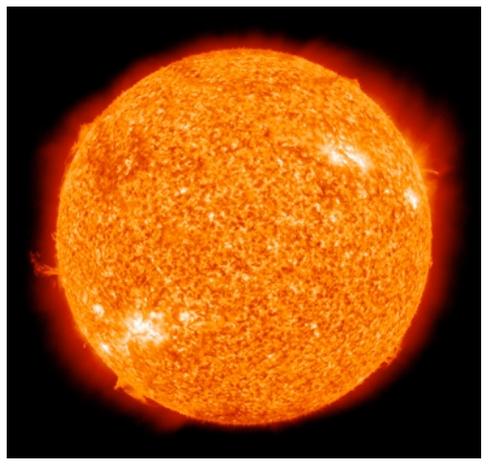

Blackbody Radiation Curves
Bodies radiating at similar temperatures
Surface of the sun: 6000 K
Carbon arc lamp: 4000 K
Lamp filament max.: 3000 K
6000 K
4000 K
3000 K
Intensity
Ultraviolet
Infrared
Wavelength

APPLICATIONS AND CONNECTIONS

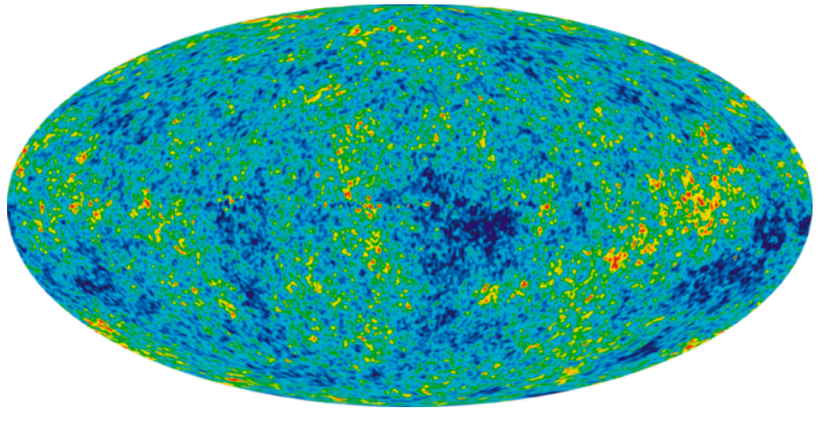
Lava flow temperature can be estimated by observing its color.



Black holes are approximate black bodies.



Sun= 5,800 K Vega= 9,600 K



The cosmic microwave background is the most perfect blackbody radiation observed in nature.

ULTRAVIOLET CATASTROPHE

The Problem: According to classical electromagnetism, theoretically the higher the temperature and the more energy an object has, the smaller the wavelength would become, resulting in ultraviolet radiation, which we can't see.

The Solution: Planck found that electromagnetic energy did not follow the classical description, but could only be emitted in discrete packets of energy proportional to the frequency.